

What is claimed is:

1. A liquid injector for injecting at least a contrast medium into a subject whose fluoroscopic image is to be captured by an imaging diagnostic apparatus, comprising:
 - a liquid injection mechanism for injecting at least said contrast medium into said subject;
 - condition storage means for storing data of operating conditions of said liquid injection mechanism for each of a plurality of regions to be imaged of a human body;
 - image storage means for storing data of schematic images of a plurality of body sections of the human body and schematic images of a plurality of regions to be imaged of the human body in association with each other;
 - section display means for displaying the schematic images of the body sections in the shape of a human body;
 - section input means for accepting an input action to select one of the displayed schematic images of the body sections;
 - region displaying means for displaying the schematic image of at least one of said regions to be imaged in relation to the selected schematic image of the body section;
 - region input means for accepting an input action to select the displayed schematic image of at least one of said regions to be imaged;
 - operation reading means for reading the data of operating conditions corresponding to the selected schematic image of at least one of said regions to be imaged; and

injection control means for controlling operation of said liquid injection mechanism under the operating conditions whose data have been read.

5 2. A liquid injector according to claim 1, wherein said liquid injection mechanism comprises a medium injection mechanism for injecting a contrast medium and a solution injection mechanism for injecting a saline solution, said condition storage means comprises means for storing data of operating conditions for interlinking said medium injection mechanism and said
10 solution injection mechanism for each of said regions to be imaged, and said injection control means comprises means for controlling operation of said medium injection mechanism and said solution injection mechanism which are interlinked under the operating conditions whose data have been read.

15 3. A liquid injector according to claim 1, wherein said condition storage means comprises means for storing, as said operating conditions, data of a variable pattern in which an injection rate of said contrast medium is changed with time to keep said fluoroscopic image in a predetermined contrast range, and said injection control means comprises means for
20 changing, with time, an operating speed of said liquid injection mechanism depending on said variable pattern.

 4. A liquid injector according to claim 3, wherein said condition storage means comprises means for storing the data of the variable pattern
25 in which the contrast of said fluoroscopic image produced by said contrast medium approximates an optimum level.

5. A liquid injector according to claim 1, further comprising:
body display means for displaying a plurality of body items of said
human body in relation to capturing of said fluoroscopic image; and
5 body input means for accepting an input action to select one of
the displayed body items;
wherein said condition storage means comprises means for
storing said operating conditions for each of said body items, and said opera-
tion reading means comprises means for reading the data of the operating
10 conditions corresponding to the selected body item.

6. A liquid injector according to claim 1, further comprising:
body display means for displaying a plurality of body items of
said human body in relation to capturing of said fluoroscopic image;
15 body input means for accepting an input action to select one of
the displayed body items; and
operation adjusting means for adjusting said operating condi-
tions depending on the selected body item.

20 7. A liquid injector according to claim 1, further comprising:
body input means for accepting entered data of body items of
said human body in relation to capturing of said fluoroscopic image; and
operation adjusting means for adjusting said operating condi-
tions depending on the entered data of body items.

25 8. A liquid injector according to claim 7, further comprising:

medium loading means for removably loading an information storage medium which stores the data of body items for said subject;

said body input means comprising means for entering the data of body items from said information storage medium which is loaded.

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9. A liquid injector according to claim 7, wherein said body input means comprises means for entering the data of body items on-line from an external database device which stores the data of body items for said subject.

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10. A liquid injector according to claim 7, wherein said body input means comprises means for detecting the data of body items from said subject and entering the detected data of body items.

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11. A liquid injector according to claim 5, wherein said body items include at least one of a body weight, a body shape, an age, and a gender.

12. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

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liquid display means for displaying said types of the contrast medium; and

liquid input means for accepting an input action to select one of the displayed types of the contrast medium;

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wherein said condition storage means comprises means for storing the data of operating conditions for the types of the contrast medium,

and said operation reading means comprises means for reading the data of operating conditions corresponding to the selected type of the contrast medium.

5 13. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

 liquid storage means for storing data of said liquid items for the types of the contrast medium;

10 liquid display means for displaying said types of the contrast medium;

 liquid input means for accepting an input action to select one of the displayed types of the contrast medium;

 liquid reading means for reading the data of the liquid item corresponding to the selected type of the contrast medium; and

15 operation adjusting means for adjusting said operating conditions depending on the read data of the liquid item.

 14. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

 liquid storage means for storing data of said liquid items for the types of the contrast medium;

 liquid input means for accepting entered data of a type of the contrast medium;

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liquid reading means for reading the data of the liquid item corresponding to the entered data of the type of the contrast medium; and

operation adjusting means for adjusting said operating conditions depending on the read data of the liquid item.

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15. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

liquid display means for displaying said liquid items; and

10 liquid input means for accepting an input action to select one of the displayed liquid items;

wherein said condition storage means comprises means for storing the data of operating conditions for said liquid items, and said operation reading means comprises means for reading the data of operating
15 conditions corresponding to the selected liquid item.

16. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

20 liquid display means for displaying said liquid items;

liquid input means for accepting an input action to select one of the displayed liquid items; and

operation adjusting means for adjusting said operating conditions depending on the selected liquid item.

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17. A liquid injector according to claim 1, wherein said contrast medium is available in a plurality of types having different liquid items in relation to capturing of said fluoroscopic image, further comprising:

liquid input means for accepting entered data of a liquid item;

5 and

operation adjusting means for adjusting said operating conditions corresponding to the entered data of the liquid item.

18. A liquid injector according to claim 12, wherein said liquid items
10 represent the concentration of an effective component of the contrast medium.

19. A liquid injector according to claim 1, wherein said imaging diagnostic apparatus is available in a plurality of types having different imaging
15 items in relation to capturing of said fluoroscopic image, further comprising:

imaging apparatus display means for displaying the types of the imaging diagnostic apparatus; and

imaging apparatus input means for accepting entered data of a selected one of the displayed types of the imaging diagnostic apparatus;

20 wherein said condition storage means comprises means for storing the data of operating conditions for the types of the imaging diagnostic apparatus, and said operation reading means comprises means for reading the data of operating conditions corresponding to the selected type of the imaging diagnostic apparatus.

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20. A liquid injector according to claim 1, wherein said imaging diagnostic apparatus is available in a plurality of types having different imaging items in relation to capturing of said fluoroscopic image, further comprising:

imaging storage means for storing data of said imaging items
5 for the types of the imaging diagnostic apparatus;
imaging display means for displaying said types of the imaging diagnostic apparatus;
imaging input means for accepting entered data of a selected one of the displayed types of the imaging diagnostic apparatus;
10 imaging reading means for reading the data of the imaging item corresponding to the selected type of the imaging diagnostic apparatus;
and
operation adjusting means for adjusting said operating conditions depending on the read data of the imaging item.

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21. A liquid injector according to claim 1, wherein said imaging diagnostic apparatus is available in a plurality of types having different imaging items in relation to capturing of said fluoroscopic image, further comprising:

imaging display means for displaying said imaging items; and
20 imaging input means for accepting entered data of a selected one of the displayed imaging items;

wherein said condition storage means comprises means for storing the data of operating conditions for said imaging items, and said operation reading means comprises means for reading the data of operating
25 conditions corresponding to the selected imaging item.

22. A liquid injector according to claim 1, wherein said imaging diagnostic apparatus is available in a plurality of types having different imaging items in relation to capturing of said fluoroscopic image, further comprising:

imaging display means for displaying said imaging items; and

5 imaging input means for accepting entered data of a selected one of the displayed imaging items; and

operation adjusting means for adjusting said operating conditions depending on the selected imaging item.

10 23. A liquid injector according to claim 1, wherein said imaging diagnostic apparatus is available in a plurality of types having different imaging items in relation to capturing of said fluoroscopic image, further comprising:

imaging input means for accepting entered data of an imaging item; and

15 operation adjusting means for adjusting said operating conditions corresponding to the entered data of the imaging item.

24. A liquid injector according to claim 19, wherein said imaging input means comprises means for accepting an input action to enter said
20 data of the selected imaging item.

25. A liquid injector according to claim 19, further comprising:
medium loading means for removably loading an information
storage medium which stores the data of the selected imaging item for each
25 of said imaging diagnostic apparatus;

said imaging input means comprising means for entering the data of the selected imaging item from said information storage medium which is loaded.

5 26. A liquid injector according to claim 19, wherein said imaging input means comprises means for entering the data of the selected imaging item on-line from said imaging diagnostic apparatus.

10 27. A liquid injector according to claim 23, further comprising:
medium loading means for removably loading an information storage medium which stores the data of the imaging items for said imaging diagnostic apparatus;

15 said imaging input means comprising means for entering the data of the imaging items from said information storage medium which is loaded.

20 28. A liquid injector according to claim 23, wherein said imaging input means comprises means for entering the data of the selected imaging item on-line from said imaging diagnostic apparatus.

25 29. A liquid injector according to claim 19, wherein said imaging items represent an imaging speed of said fluoroscopic image.

30 30. A liquid injector according to claim 1, further comprising:
medium loading means for removably loading an information storage medium which stores the data of operating conditions; and

condition updating means for reading the data of operating conditions from said information storage medium which is loaded and updating the data of operating conditions stored in said condition storage means with the read data of operating conditions.

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31. A liquid injector according to claim 1, further comprising:

condition input means for entering the data of operating conditions on-line; and

condition updating means for updating the data of operating conditions stored in said condition storage means with the data of operating conditions entered on-line.

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32. A liquid injector according to claim 1, further comprising:

operation display means for displaying the data of operating conditions;

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operation input means for accepting a manual action to correct the displayed data of operating conditions; and

condition updating means for updating the data of operating conditions stored in said condition storage means with the corrected data of operating conditions.

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33. A liquid injector according to claim 1, further comprising:

operation display means for displaying the data of operating conditions which are read for the selected region to be imaged;

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operation input means for accepting a manual action to correct the displayed data of operating conditions; and

operation adjusting means for correcting the data of operating conditions based on said manual action.

5 34. A liquid injector according to claim 1, further comprising:
 an injection head for removably holding a liquid syringe which
comprises a cylinder filled with at least a contrast medium and a piston
slidably inserted in said cylinder; and
 a display panel connected parallel to said injection head for
displaying various data thereon;
10 said liquid injection mechanism comprising means for moving
said cylinder and said piston relatively to each other while said liquid syringe
is being held by said injection head;
 said section display means comprising means for displaying
the schematic images of the body sections on said display panel;
15 said region displaying means comprising means for displaying
the schematic image of at least one of said regions to be imaged on said
display panel.

20 35. A liquid injector according to claim 34, wherein said display
panel comprises a touch panel for detecting a manual action applied thereto;
 said section input means comprising means for detecting a
manual action applied to one of the schematic images of the body sections
displayed on said touch panel;
 said region input means comprising means for detecting a
25 manual action applied to one of the schematic images of the regions to be
imaged which are displayed on said touch panel.

36. A liquid injector according to claim 34, further comprising:
pressure detecting means for detecting in real-time a pressure
of at least said contrast medium injected into said subject; and
5 pressure displaying means for displaying in real-time the de-
tected pressure on said display panel.

37. A method of injecting at least a contrast medium with a liquid
injection mechanism into a subject whose fluoroscopic image is to be cap-
10 tured by an imaging diagnostic apparatus, comprising the steps of:
storing data of operating conditions of said liquid injection
mechanism for each of a plurality of regions to be imaged of a human body;
storing data of schematic images of a plurality of body sections
of the human body and schematic images of a plurality of regions to be im-
15 aged of the human body in association with each other;
displaying the schematic images of the body sections in the
shape of a human body;
receiving an input action to select one of the displayed sche-
matic images of the body sections;
20 displaying the schematic image of at least one of said regions
to be imaged in relation to the selected schematic image of the body section;
receiving an input action to select the displayed schematic im-
age of at least one of said regions to be imaged;
reading the data of operating conditions corresponding to the
25 selected schematic image of at least one of said regions to be imaged; and

controlling operation of said liquid injection mechanism under the operating conditions whose data have been read.

38. A computer program for controlling a liquid injector for injecting
5 at least a contrast medium with a liquid injection mechanism into a subject whose fluoroscopic image is to be captured by an imaging diagnostic apparatus, so as to enable said liquid injection mechanism to carry out a process which comprises the steps of:
- 10 storing data of operating conditions of said liquid injection mechanism for each of a plurality of regions to be imaged of a human body;
 - storing data of schematic images of a plurality of body sections of the human body and schematic images of a plurality of regions to be imaged of the human body in association with each other;
 - 15 displaying the schematic images of the body sections in the shape of a human body;
 - receiving an input action to select one of the displayed schematic images of the body sections;
 - displaying the schematic image of at least one of said regions to be imaged in relation to the selected schematic image of the body section;
 - 20 receiving an input action to select the displayed schematic image of at least one of said regions to be imaged;
 - reading the data of operating conditions corresponding to the selected schematic image of at least one of said regions to be imaged; and
 - controlling operation of said liquid injection mechanism under
25 the operating conditions whose data have been read.

39. An information storage medium storing data of a computer program according to claim 38 for controlling a liquid injector for injecting at least a contrast medium with a liquid injection mechanism into a subject whose fluoroscopic image is to be captured by an imaging diagnostic apparatus.

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